Letter to the Editor

Dear Dr. Jeffrey A Platt,

I read the manuscript "Effectiveness of Light Sources on In-Office Dental Bleaching: A Systematic Review and Meta-Analyses" published recently in *Operative Dentistry* and was surprised about the findings regarding the use of light sources to reduce the intensity of tooth sensitivity caused by in-office bleaching. These findings are highlighted in both the "Clinical Relevance" and "Conclusion" sections. The authors stated that "the use of in-office bleaching techniques with light sources is recommended to improve the performance of bleaching gels." Except for Figure 6, the other forest plots do not support this statement since no difference between the control and the experimental treatments are demonstrated (as expected). However, the forest plot illustrated in Figure 6 (Figure 1) concludes that using a light source reduces the intensity of tooth sensitivity despite only a single study included in the meta-analysis that found this result. In fact, the meta-analysis presents several flaws. Considering that this kind of study is the top evidence for determining clinical approaches, it is important to carefully revise the systematic review and data analysis, even after the publication of the study. I describe below the main flaws regarding the conclusion based on the outcome of intensity of tooth sensitivity.

STUDY 1

- Alomari Q & El Daraa E (2010) A randomized clinical trial of in-office dental bleaching with or without light activation *Journal of Contemporary Dental Practices* **11(1)** E017-E024.
  - The citation should be revised: Alomari & El Daraa, 2010 instead of Allomari, Ehsan; Daraa 2011.
- "Tooth sensitivity was evaluated immediately after the bleaching procedure and after one month.
- "Sensitivity was evaluated by blowing air from the air-water syringe of the dental unit over the labial surfaces of the upper anterior teeth for five seconds. The degree of sensitivity was recorded according to the following criteria: 0 – no sensitivity; 1 – slight sensitivity; 2 – moderate sensitivity; 3 – severe sensitivity."
  - Therefore, the data must be adjusted to scale from 0 to 10. Moreover, data from this study was included three times in the meta-analysis since three lights were evaluated. This approach incorrectly resulted in 30 patients undergoing tooth bleaching without light, while only 10 patients were evaluated under this experimental condition. The better approach would be to calculate the average tooth sensitivity when the different lights were used (the type of light was not analyzed) and insert into this study once.

STUDY 2

- de Almeida LC, Costa CA, Riehl H, dos Santos PH, Sundfeld RH, & Briso AL (2012) Occurrence of sensitivity during at-home and in-office tooth bleaching therapies with or without use of light sources *Acta Odontology Latinoam* **25(1)** 3-8.
  - The citation should be revised: Almeida and others, 2012 instead Almeida et al. 2011.
- "The intensity of sensitivity was recorded using an analog scale with values from 0 to 10."
  - Data from this study were included two times in the meta-analysis since two lights were evaluated. This approach incorrectly resulted in 20 patients (only 10 were evaluated) undergoing tooth bleaching without light. Adding data only one time with the average of data from tooth bleaching with any light can solve this problem.

STUDY 3

- Bortolato JF, Pretel H, Neto CS, Andrade MF, Moncada G, & Junior OBO (2013) Effects of LED–laser hybrid light on bleaching effectiveness and

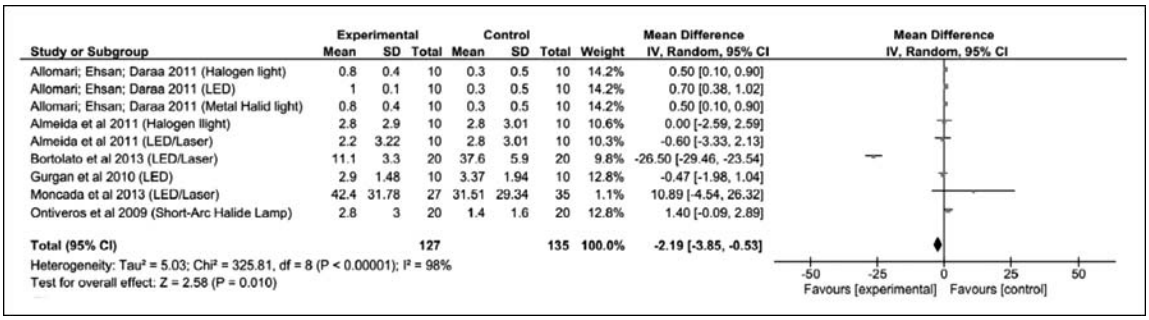

Figure 1. *Figure 6 from the article.*

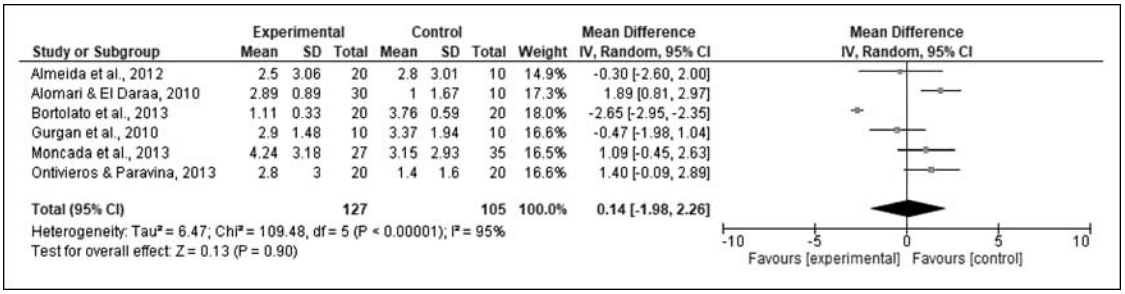

Figure 2. *Figure 6 after revision.*

tooth sensitivity: a randomized clinical study *Laser Physics Letter* 2013;**10:085601**.

- "Sensitivity (S) or discomfort caused by the bleaching treatment was scored using a visual analog scale (VAS). The patient quantifies his pain response by making a mark in a 100 mm length line anchored by word descriptors at each end: 'no pain' at the left-hand end and 'very severe pain' at the right-hand end."
  - Data should be adjusted to scale from 0 to 10.

STUDY 4

- Gurgan S, Cakir FY, & Yazici E (2010) Different light-activated in-office bleaching systems: a clinical evaluation *Lasers in Medical Science* **25(6)** 817-822.
- "To monitor tooth and gingival sensitivity, we asked the participants to mark a standardized 100 mm visual analog scale (VAS) ranging from 0 to 10."

STUDY 5

- Moncada G, Sepúlveda D, Elphick K, Contente M, Estay J, Bahamondes V, Fernandez E, Oliveira OB, & Martin J (2013) Effects of light activation, agent concentration, and tooth thickness on dental sensitivity after bleaching *Operative Dentistry* **38(5)** 467-476.
- "TS or discomfort caused by the bleaching treatment was self-assessed with the use of the Visual Analog Scale (VAS), in which the patient quantified his painful response by making a mark in a 100-mm–long line that was anchored by word descriptors at each end: 'no pain' at the left end and 'very severe pain' at the right end."
  - Data should be adjusted to scale from 0 to 10.

STUDY 6

- Ontiveros JC & Paravina RD (2009) Color change of vital teeth exposed to bleaching performed with and without supplementary light *Journal of Dentistry* **37(11)** 840-847.
  - The citation should be revised: Ontiveros & Paravina, 2009 instead of Ontiveros et al. 2009.
- After correction, the new meta-analysis showed the forest plot presented in Figure 2, and no difference between the treatment is demonstrated.
- Another important matter is that the high heterogeneity of data (I^2 = 95%) impairs the meta-analysis; otherwise, the heterogeneity is not explained. The sensitivity analysis demonstrates that a single study (Bortollato and others, 2013) is

Table 1. *Sensitivity ("Leave-One-Out") Analysis*

Influential Analysis (Random Effects Model)	MD	95% CI	*p*-Value	I^2, %
Omitting Almeida and others 2012	0.2182	[−2.1576; 2.5939]	0.8572	96.3
Omitting Alomari and El Daraa 2010	−0.2408	[−2.2957; 1.8141]	0.8183	92.9
Omitting Bortolato and others 2013	*0.8875*	*[−0.0551; 1.8302]*	*0.0650*	*48.3*
Omitting Gurgan and others 2010	0.2640	[−2.2412; 2.7692]	0.8364	96.2
Omitting Moncada and others 2013	−0.0488	[−2.4023; 2.3046]	0.9675	95.7
Omitting Ontivieros and Paravina 2013	−0.1130	[−2.4238; 2.1978]	0.9236	95.5
Pooled estimate	0.1388	[−1.9834; 2.2609]	0.8980	95.4

responsible for this high heterogeneity. It is important to emphasize that this study was conducted by some authors from the Research and Education Center for Phototherapy in SP, Brazil, that is responsible for the light source (and whitener) used in the study (Table).

Best regards,

Dr Andre L. Faria-e-Silva

Author Response

Dear Dr. Jeffrey A Platt,

Thank you for giving us the opportunity to reply to the Letter to the Editor in response to our article "Effectiveness of Light Sources on In-Office Dental Bleaching: A Systematic Review and Meta-Analyses." We would like to thank the author of the letter for the time taken and care with our study and would like to clarify some items.

Regarding the author's comments on the "Clinical Relevance" and "Conclusion" sections of the article, it is important to note that our study made clear in the conclusion that the use of lights for in-office bleaching is not imperative in achieving the desired esthetic clinical results.

With regard to tooth sensitivity, this parameter was evaluated not only by tooth sensitivity intensity (mean and standard deviation) but also by tooth sensitivity incidence. In the second analysis, through dichotomous outcomes, no differences were observed between the use of light for activation of the bleaching gel compared with the absence of light activation. However, when the sensitivity intensity was evaluated, a favorable difference was observed for the experimental group. Regarding the influence of the use of different subgroups (based on the type of light), and thus the duplication of the control group based on comparative light type, the analysis based in this way was according to previous published studies that also used the same method in their analyses,[1-3] and we emphasize that this difference in the value of "n" after the duplication of the control group does not interfere in the final result of the meta-analysis. We understand the author's suggestion of the realization of the average of data (mean and standard deviation) from tooth bleaching thus disregarding the influence of the type of light. However, we believe that obtaining the mean of the mean values provided by the data could be considered for the mean value, but obtaining the mean of the values related to the standard deviation would not be possible in this way and thus would require the raw data used by the authors to obtain the general mean of the standard deviation (isolating the light factor). Therefore, we chose to perform the analysis in the way that was used in the article. We agree with the author that the study of Bortolato and others[4] had a great impact on the favorable result obtained with the use of light. As a result, within the article published in the Results section, we highlight, "However, data were heterogeneous (v2: 325.81; I2 = 98%; p, 0.0001)," and all studies included in the analysis did not share a common effect size. After a detailed analysis, the study by Bortolato and others[4] did have an impact on the high heterogeneity of this outcome. When this study was removed from the present meta-analysis, the heterogeneity was not significant, and the overall mean difference was shown to be significant with a lower chance of tooth sensitivity for the nonbleaching procedure (data not shown). This is one of the factors that justified the conclusion sentence that we used in the work: "The use of lights for in-office bleaching is not imperative in achieving the desired esthetic clinical results."

We are grateful for the observations pointed out by the author regarding the correction of citations from three studies. Despite this, the studies are referenced in the present study, and in the case of the meta-analysis graph, these differences also do not influence the final analysis of the mentioned data. For the tooth sensitivity data tabulation, we did not specify the type of visual analog scale used but merely added the type of data as dichotomous or continuous, similar to the work of He and others.[5]

Thus, this letter is a reaffirmation of the overall evidence and the results reported in our study. We hope that these clarifications have answered the letter author's questions.

REFERENCES

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2. Medeiros FCFL, Kudo GAH, Leme BG, Saraiva PP, Verri FR, Honório HM, Pellizzer EP, & Santiago Junior JF (2018) Dental implants in patients with osteoporosis: a systematic review with meta-analysis *International Journal of Oral and Maxillofacial Surgery* **47(4)** 480-491.
3. de Mello CC, Bitencourt SB, Dos Santos DM, Pesqueira AA, Pellizzer EP, & Goiato MC (2018) The effect of surface treatment on shear bond strength between Y-TZP and

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4. Bortolato JF, Pretel H, Neto CS, Andrade MF, Moncada G, & Junior OBO (2013) Effects of LED–laser hybrid light on bleaching effectiveness and tooth sensitivity: a randomized clinical study. *Laser Physics Letter* **2013;10(805601).** http://dx.doi.org/10.1088/1612-2011/10/ 8/08560
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